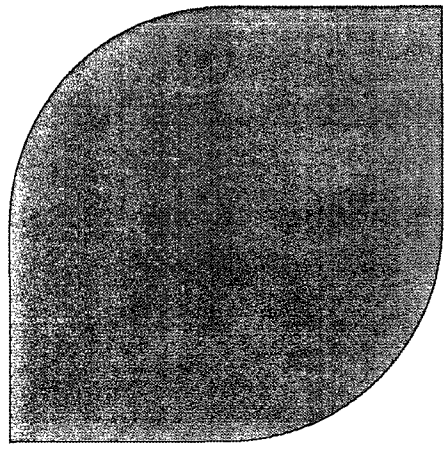
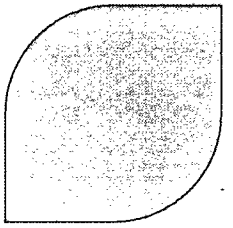


Small Break LOCA Topical Report Supplement

W & CE LOCA

AREVA

Agenda

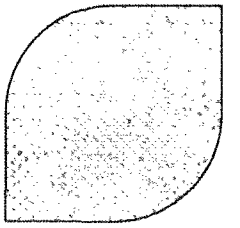


- Summary of Revisions to NRC Approved Small Break LOCA (SBLOCA) Model for Westinghouse and Combustion Engineering Plants
- NRC Review Schedule

Introduction

- **Recent submittals for SBLOCA applying the methods as documented in EMF-2328, Rev. 0**
  - **Clear gap between current environment and previously approved methodology**
  - **Strict adherence to EMF-2328, Rev. 0 may not ensure adequate information is provided in a Licensee's LAR**
    - May not provide sufficient demonstration of compliance with SRP guidance without inclusion of significant additional analysis material
  - **Significant additional information being requested during licensing reviews causing licensing delays**
- **AREVA identified eight areas of concern and proposed resolutions for each (June 24, 2011)**
- **EMF-2328, Rev. 0 Supplement 1 submitted (March, 2012)**

Summary of Revisions to SBLOCA Model



- Spectrum of Break Sizes
- Core Bypass Modeling
- Reactivity Feedback
- RCP Trip
- Biasing of Input Parameters
- LOOP Seal Clearing
- Break in Attached Piping
- Core Nodalization

More Detailed Break Spectrum

Issue

EM does not prescribe requirements concerning the modeling of the spectrum of postulated SBLOCAs. Recent analyses have utilized break spectra based on generic geometry and not plant phenomenology. The spectrum needs to consider those break sizes that prevent safety injection tank deployment until immediately before and after the time of PCT.

Supplement 1 Resolution

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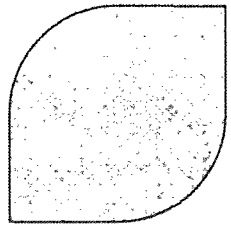
- Consideration of the mitigating ECC systems (HHSI, Accumulator injection, etc.) should be involved in determining the refinement of the break spectrum



Core Bypass Flows

Issue

Additional analyses and evaluations have been requested to determine, and correct for, the impact of inappropriately modeling of flow through hot leg nozzle gaps and core barrel leakage paths

Supplement 1 Resolution

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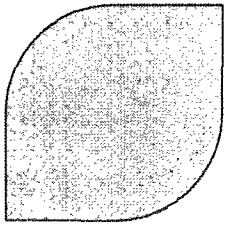


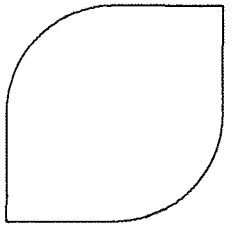
▶ Modeling Reactivity Feedback

◈ Issue

EMF-2328 Rev.0 only provides for reactivity insertion from control rod trip – this is a conservative approach whenever the moderator reactivity insertion is negative.

◈ Supplement 1 Resolution

- AREVA will include full range reactivity feedback (MTC and Doppler)
- When Technical Specifications (TS) allow a positive MTC at full power, the maximum plausible value will be incorporated in order to allow an increase in power prior to scram



▷RCP Trip Study

◇ Issue

Post-TMI requirement **(for SBLOCA analyses to identify])** *critical operator time to secure the RCP's. Please perform an analysis of hot leg breaks to demonstrate that the limiting break location for the RCP trip timing criteria has been identified.*

◇ Supplement 1 Resolution

- For plants that do not have an automatic RCP trip, a spectrum of both CLPD and HL breaks will be analyzed to evaluate RCP trip time
- A modeling approach selected by the applicant will be used (most likely that employed in the previous licensing)

▷Biasing of Plant Input Parameters

◇ Issue

Using nominal values for Accumulator and RWST temperature should be biased to a conservative value allowed within Technical Specifications

◇ Supplement 1 Resolution

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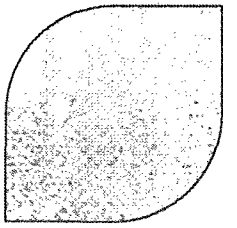

Loop Seal Clearing

Issue

EM relies on the SRELAP-5 code to predict the clearing of reactor coolant loop seals. Numerous emergency core cooling experiments have demonstrated the variability inherent in the loop seal clearing process. The S-RELAP5 model may not provide an appropriate characterization of this phenomenon.

Supplement 1 Resolution

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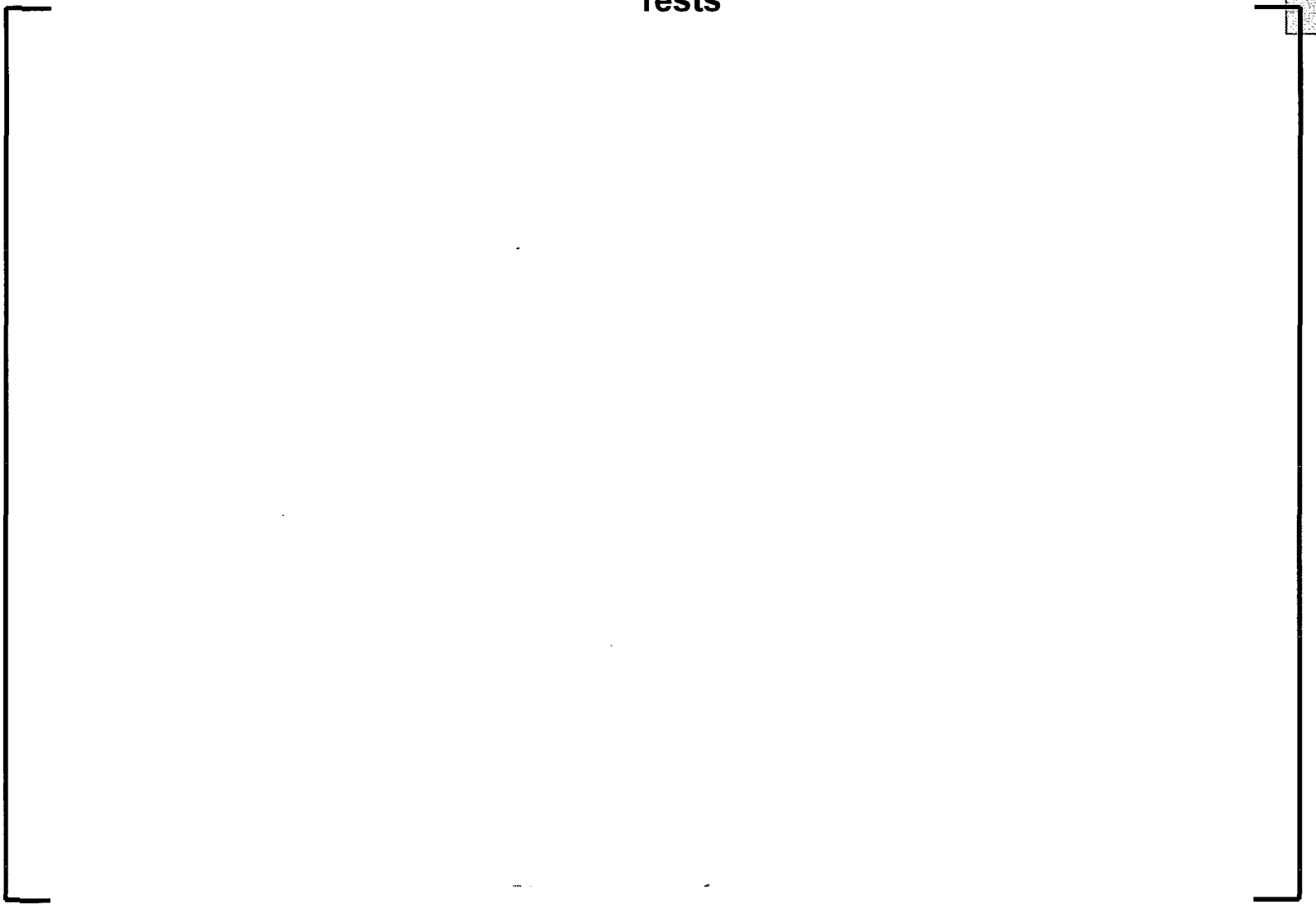
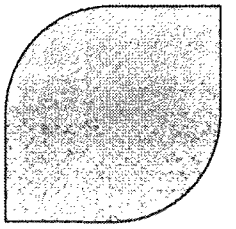
Figure 14-1. Loop Seal Clearing Versus Break Size for Various Tests





Addition of Injection Line Break

Issue

Provide results of an analysis of a severed injection line with degraded injection into the RCS since one of the lines spills to containment, while the others inject at the much higher RCS pressures.

Supplement 1 Resolution

- AREVA will perform a SBLOCA analysis assuming the severance of an injection line (Accumulator/SIT and pumped SI) with degraded SI
- Break area can be larger than current upper limit of SBLOCA model
  - The event follows the classic SBLOCA boil down and refill process
  - Best treated with SBLOCA model
- AREVA will use the SBLOCA methodology for these breaks and request NRC approval for this in the SBLOCA Supplement

▷ Core Nodalization Spacing

◇ Issue

Because of the homogeneous assumption regarding vapor and liquid mixing in a control volume (cell) in S-RELAP5, saturated conditions are imposed on the entire volume regardless of the amount of liquid contained in the volume. As such, no heat-up occurs in the cell containing the two-phase surface in the core until all of the liquid in the cell drains to the cell below. NRC Staff feels more cells in the core region are required or modifications to compute the two-phase surface within the cell containing the level are necessary to properly account for the vapor superheat and cladding heat-up in this region.

◇ Supplement 1 Resolution

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NRC Review Schedule

▷ EMF-2328 Supplement 1 Submitted	March 2012
▷ Pre-submittal Meeting	September 2011
▷ Post-submittal Meeting	Today
▷ NRC RAIs	TBD
▷ Draft SER	TBD